

Home Work

Find the Dual for the following Primal problem:

$$\text{Max } Z = 5 X_1 + 6 X_2$$

Subject to:

$$X_1 + 2 X_2 = 5$$

$$-X_1 + 5 X_2 \geq 3$$

$$4 X_1 + 7 X_2 \leq 8$$

X_1 is unrestricted That mean $X_1 = X_1^+ - X_1^-$ where $X_1^+, X_1^- \geq 0$

$$X_2 \geq 0$$

Solution

Standard Form:

$$\text{Max } Z = 5 X_1 + 6 X_2 - 0 S_1 + 0 S_2$$

S.T:

$$X_1 + 2 X_2 = 5$$

$$-X_1 + 5 X_2 - S_1 = 3$$

$$4 X_1 + 7 X_2 + S_2 = 8$$

X_1 is unrestricted then $X_1 = X_1^+ - X_1^-$ where $X_1^+, X_1^- \geq 0$

يبقى هنعوض في الـ Standard form عن كل X_1 بـ $X_1^+ - X_1^-$

$$\text{Max } Z = 5 X_1^+ - 5 X_1^- + 6 X_2 - 0 S_1 + 0 S_2$$

$$X_1^+ - X_1^- + 2 X_2 = 5$$

$$-X_1^+ + X_1^- + 5 X_2 - S_1 = 3$$

$$4 X_1^+ - 4 X_1^- + 7 X_2 + S_2 = 8$$

$$X_1^+, X_1^-, X_2, S_1, S_2 \geq 0$$

Dual :

$$\text{Min } Z = 5 Y_1 + 3 Y_2 + 8 Y_3$$

S.T:

$$Y_1 - Y_2 + 4 Y_3 \geq 5$$

$$X_1^+$$

$$-Y_1 + Y_2 - 4 Y_3 \geq -5$$

$$X_1^-$$

$$2 Y_1 + 5 Y_2 + 7 Y_3 \geq 6$$

$$X_2$$

$$-Y_2 \geq 0$$

$$S_1$$

$$Y_3 \geq 0$$

$$S_2$$

Y_1 is unrestricted,

YOUTH ASSOCIATION OF THIRD YEAR

Best Wishes